

Influence of Bed Height on the Growth Of Slash and Loblolly Pine on a Leon Fine Sand in Northeast Florida

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ABSTRACT. Genetically improved slash (*Pinus elliottii* Engelm. var. *elliottii*) and loblolly pine (*P. taeda* L.) seedlings were planted on a Leon fine sand soil on a flatwoods site which received disking, low-bedding, or high-bedding treatment. After ten growing seasons there was no difference between slash pine growth on disked and low-bedded plots. High bedding improved slash pine growth over the other treatments. Loblolly pine responded more than slash to bed height with a clear trend of increasing growth and yield with higher beds. Wood production trends were as follows: (1) Slash pine produced the most wood volume on disked plots; (2) there was no species difference on low-bedded plots, and; (3) loblolly was better than slash pine on high-bedded plots.

About 40 percent of the forest land in the Lower Coastal Plain is poorly drained flatwoods. Bedding these wet sites prior to planting pines has been shown to improve early growth (Derr and Mann 1977, Haines and Pritchett 1964, Lennartz and McMinn 1973). A variety of equipment was used to construct beds in these early studies, which resulted in beds of various heights. It seemed likely that bed height would affect growth, but whether the effect was significant was not known. This study was established to determine the effect of bed height on survival and growth of slash and loblolly pines on a poorly drained Leon soil in the Atlantic Coastal Plain. Reported here are the 10-year results.

METHODS

The study area is located in northeast Florida on the USDA Forest Service Olustee Experimental Forest. The soil is a somewhat poorly drained Leon fine sand (sandy, siliceous, thermic, Aeric Haplaquod). This is a common flatwoods soil with low natural fertility, a spodic horizon at 12 to 18 inches, and the water table near the surface during portions of the year.

The study is a randomized block, split-plot design with five blocks. Each block contains three treatment plots which were prepared by either flat disking, low bedding, or high bedding. Each treat-

ment plot was split and half was planted to slash and the other half to loblolly pine. Each species subplot is 96 by 78 feet with a four-row perimeter buffer strip.

In 1968 a sparse stand of 60-year-old longleaf pine (*P. palustris* Mill.) was harvested from the study site. At that time the understory was mainly saw-palmetto (*Serenoa repens* (Bartr.) Small) and gallberry (*Ilex glabra* (L.) Gray). In April 1970, the site was prescribed burned and one month later harrowed twice with a heavy-duty offset disk-harrow. After harrowing beds were constructed on the appropriate plots. Low beds on 12-foot centers and 6 inches above the original groundline were formed with a Rome bedding plow. High beds, also on 12-foot centers, but 15 inches above the original groundline, were made with the Rome bedding plow and a fire plow. The entire area was prescribed burned a second time in March 1972, one week before planting.

Both loblolly and slash pine seedlings were grown from genetically improved seeds. The loblolly seed was obtained from a Georgia Forestry Commission clonal seed orchard with most of the clones from Piedmont sites. Slash pine seed was collected from seed orchards on the Olustee Experimental Forest. All seedlings were grown by the Florida Division of Forestry at their Chiefland nursery. Seedlings were lifted and planted at 6-foot intervals in rows 12 feet apart in March 1972. Because of drought conditions, planting had been delayed and many of the slash pine seedlings had broken dormancy before they were planted. This resulted in high subsequent mortality, about 40 percent. Since this is unusual, dead seedlings of both species were replaced in July 1972 with seedlings from the same nursery stock that had been potted and kept in a shade house.

RESULTS

With replacement seedlings, both species had 95-percent survival on all treatments 10 years

Table 1. Effect of site preparation on growth and yield of slash and loblolly pines at age 10.

Species and site treatment	Average diameter	Average height	Volume ¹
	<i>Inches</i>	<i>Feet</i>	<i>Ft.³/acre</i>
Slash			
flat disked	4.1 a ²	28.1 a	660 a
low beds	4.1 a	29.3 a	700 a
high beds	4.3 a	31.4 a	805 b
average	4.2	29.6	722
Loblolly			
flat disked	3.9 a	25.0 a	595 a
low beds	4.3 a	26.9 a	720 b
high beds	4.9 b	31.4 b	1005 c
average	4.4	27.8	773

¹ Total inside-bark volumes based on equation of Schmitt and Bower (1970).

² Values within a column for each species not followed by the same letter are significantly different at the .05 level.

after planting. Fusiform stem cankers were uniformly low at about 1 and 3 percent for surviving slash and loblolly pine, respectively. Slash pine growth on disked plots was not significantly different from that on low-bedded ones (Table 1). There was a significant increase in slash pine volume on high beds compared to low beds or disked sites. Loblolly pine was more responsive to bedding than slash pine. Diameters and heights were significantly greater on the high beds than on the low ones or the disked-only plots. The volume of wood/acre increased significantly as bed height increased.

Species comparisons show no difference in diameter between loblolly and slash pine on disked or low-bed plots, but loblolly was larger than slash pine when planted on high beds. Slash pine, however, was equal in height to loblolly on high beds, and taller on low beds and disked plots. There was a significant interaction between species and site preparation in volume of wood produced. Slash pine produced more than loblolly on disked plots, but loblolly produced more wood on high-bedded plots. There was no difference between species in volume produced on the low beds.

DISCUSSION

Standard bedding techniques, which correspond to the low-bed treatment in this study, apparently are not beneficial to slash pine growth on this soil. Competition control through disking was just as good as low bedding. A similar study adjacent to that reported here supports this conclusion (Outcalt 1983).

Slash pine growth was improved by high bedding but the difference may diminish as the trees get older. A similar study planted on the same soil type, using the same improved families of slash

Table 2. Effect of bed height on survival, growth, and yield of slash pine.

Site preparation	Survival	Average diameter	Average height	Volume ¹
	<i>Percent</i>	<i>Inches</i>	<i>Feet</i>	<i>Ft.³/acre</i>
		<i>Age 10</i>		
Low beds	69	5.0	31.5	630
High beds	63	5.3	33.4	830
		<i>Age 15</i>		
Low beds	60	7.5	50.5	1580
High beds	55	7.6	50.5	1545

¹ Volume inside bark to a 3-inch DOB top based on equation by Bennett and others (1959).

pine and the same high- and low-bed treatments, is located about two miles away. At age 10, trees on high beds were larger and had produced more wood than those on low beds (Table 2). By age 15 all differences had disappeared. Cain (1978) also found that early gains in height growth as a result of bedding had decreased by age 15. Thus, it is expected that the slash pine on the other treatments in this study will overtake those on the high beds before they reach pulpwood rotation age.

Loblolly benefited more than slash pine from bedding. This is contrary to past results (Derr and Mann 1977, Haywood 1980), but those were for finer-textured Gulf Coast soils. This points out the need for prescribing bedding by soil type, as indicated by Broerman et al. (1983). The difference between treatments with loblolly pine may also diminish with time, but it appears, for the high beds at least, that some advantage will be maintained over the rotation.

There is the possibility that slower growth of the replants in the slash pine plots could bias the results making loblolly appear better than it is. This seems unlikely, however, for in an adjacent study yields at age 10 were nearly equal to those here at 680 and 705 ft³/acre for disked and low-bed plots, respectively. Also there was no indication that slash replants were growing slower than the original seedlings. Therefore, although slash pine is the preferred species on Leon fine sand, loblolly may outproduce it if planted on 15-inch-high beds.

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